REMARKS

Receipt of the final Office Action dated March 16, 2005 is acknowledged. Claims 1, 3, 5, 13, 24, 50, 62, and 73 have been amended. Claims 1-9, 11-21, 23-32, 34, 50-58, 60-70, 72-81 and 83 remain in the application.

Claims 1-8, 13-20, 24-31, 50-57, 62-69, and 74-80 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art of this application ("AAPA") in view of Tsujimura, et al. (U.S. Patent 6,391,691) ("Tsujimura").

Claims 9, 11-13, 21, 23, 24, 32, 34, 58, 60-62, 70, 72, 73, 81, and 83 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the AAPA of this application in view of Tsujimura as applied to claims 1-8, 13-20, 24-31, 50-57, 62-69, and 74-80 above, and further in view of Washizuka et al. (IDW 1997 pp. 207-210) ("Washizuka"). Entry and reconsideration is respectfully requested.

The instantly claimed invention relates to a method of making a thin film transistor ("TFT"), which includes providing an impurity 5 (Fig. 1(a)) on an amorphous silicon layer 4, forming drain and source electrodes 7, 8 (Fig. 1(b)) separated by a channel region over a contact portion of the amorphous silicon layer, removing the impurity 5 from the channel region (Fig. 1(c)), and diffusing the impurity into the contact portion to form an ohmic contact 6 (Fig. 1(d)) within the amorphous silicon layer.

According to the claimed invention, the impurity provided on the amorphous silicon layer is removed after the electrodes are formed. Thus, even if the device is exposed to hydrogen plasma to remove the impurity adhered to the channel region, the impurity needed to establish ohmic contact is not maintained, and sufficient impurity levels can be diffused onto the amorphous silicon layer. With the present invention, even by exposing the structure to hydrogen plasma for a long time in order

to sufficiently remove the impurity adhered to the back-channel, it is possible to form the necessary impurity to form the ohmic contact layer. Moreover, according to the present invention a low resistive ohmic layer can be formed since a sufficient amount of impurity can be diffused in a short time.

Claim 1 recites the steps of "forming [electrodes] separated by a channel region over a contact portion with [an] amorphous silicon layer," "subsequently, removing . . . impurity from said channel region and diffusing said impurity into said contact portion to form a contact layer within said amorphous silicon layer," and "removing the impurity formed over the amorphous silicon in the channel region between the drain and source electrodes while retaining the impurity over the amorphous silicon film surface contacted with drain and source region" Like the claimed invention, the AAPA process includes the step of forming electrodes 66, 67 (Fig. 6(b)) separated by a channel region. The AAPA process does not, however, include the step of "subsequently . . . diffusing . . . impurity into [a] contact portion to form a contact layer within [an] amorphous silicon layer" or "removing the impurity formed over the amorphous silicon in the channel region between the drain and source electrodes while retaining the impurity over the amorphous silicon film surface contacted with drain and source region." In the AAPA process, impurity in the low resistance amorphous silicon layer 65 is not diffused anywhere. In the AAPA process, the amorphous silicon layer 65 (Fig. 6(a)) is the contact layer, and the contact layer 65 is formed prior to the formation of the electrodes 66, 67 (Fig. 6(b)).

The Office Action contends that it would have been obvious, in view of Tsujimura, to modify the AAPA process "to enable the process of diffusing the impurity into the contact portion to form a contact layer within the amorphous silicon layer of the AAPA . . . ." Neither AAPR nor Tsujimura, however, either alone or in combination, disclose or suggest the step of "removing the impurity formed over the

amorphous silicon in the channel region between the drain and source electrodes while retaining the impurity over the amorphous silicon film surface contacted with drain and source region."

Moreover, Tsujimura relates to a top gate TFT device. The Tsujimura process involves diffusion of impurity into the metal electrodes 4, 5 in a first direction -- from a layer 6 into the electrodes -- followed by removal of the layer 6, followed by formation of another layer 9, followed by diffusion of the impurity in a second, opposite direction -- from the metal electrodes into the newly formed layer 9. It is unclear how or why the Tsujimura diffusion process would be considered applicable to the AAPA process, a bottom gate TFT device, where there is no opportunity for removal of the contact layer 65 from under the electrodes 66, 67 once the electrodes are formed.

In other words, while Tsujimura process might be considered applicable to the formation of the contact layer in the AAPA process, the AAPA process would have to be completely reconstructed to somehow provide for diffusion of impurity into the electrodes 66, 67 from a point between the electrodes 66, 67 and the contact layer 65. The AAPA electrodes 66, 67 are formed after the contact layer 65, and the contact layer 65 would somehow have to be removed from under the electrodes 66, 67 and replaced by another layer, and neither reference suggests any mechanism or motivation for doing so.

For at least these reasons, claim 1 is patentable over AAPA in view of Tsujimura. Claims 2-8, 13-20, 24-31, 50-57, 62-69 and 74-80 should be allowable for reasons similar to those given above in connection with claim 1, and for other reasons.

Claims 9, 11-13, 21, 23, 24, 32, 34, 58, 60-62, 70, 72, 73, 81 and 83 stand rejected under 35 U.S.C. § 103 as being unpatentable over AAPA in view of Tsujimura and further in view of Washizuka. Reconsideration is respectfully requested.

For the reasons set forth above, claims 1-8, 13-20, 24-31, 50-57, 62-69 and 74-80 are patentable over AAPA in view of Tsujimura. Washizuka is cited in the rejection for teaching simultaneously diffusing and annealing a capping layer. This is not related to the arguments presented above. Washizuka does not overcome the deficiencies in AAPA or Tsujimura. For at least these reasons, claims 9, 11-13, 21, 23, 24, 32, 34, 58, 60-62, 70, 72, 73, 81 and 83 should be allowable for reasons similar to those given above in connection with claim 1, and for other reasons.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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